System Manual

For Modules Of The

Cube67 Series

- For use in combination with SW Version 2.xx -

User Manual Art. No. 56 970 Version 2.2

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Manual Revisions

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1.1	Ch. 4	New modules	28.08.03 / Grofik
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2.3	3.1.5	New module 56642	18.01.2012 us/hi
2.4	3	Change of german text in headline 3	30.11.2012 us/csc

Notes :

1 About This Manual

Please be sure to read this User Manual prior to starting up the equipment. The manual must be stored in a visible location and be accessible to all users at all times.

User Manuals for Modules of the Cube67 Series :

- Cube67 System Manual, Art. No. 56 970,
- Cube67 Bus System Manual PROFIBUS Art. No. 56 980,
  DeviceNet Art. No. 56 981,
  CANopen Art. No. 56 982
  Ethernet/IP Art. No. 56 983,
  DeviceNet V2 Art. No. 56 984,
  PROFINET Art. No. 56 985
- Cube67 Technical Data Art. No 56 971.
- Cube67 "Secure shutdown of malfunctioning secure modules“ Art. No. 56972

The text, illustrations, diagrams and examples presented in this manual serve solely for the purpose of explanation, operation and use of Input/Output modules of the Cube67 series.

If you should have any further reaching questions regarding the installation and setup of the equipment described in this manual, please do not hesitate to contact us. We are glad to assist you at any time.

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Murrelektronik reserves the right to change technical specifications or contents of this manual at any time without notice.

1.1 Chapter Overview

You must read the “Safety Information” section without fail **before** working with the products and the system. This section contains information required for safe installation and handling.

The “Configuration Information“ section directs itself to system planners. It offers important information and details relevant to successful configuration.

The Cube67 Technical Data manual contains comprehensive installation and technical information.

To set up the Cube67 field bus node, refer to the relevant user manuals of your field bus system.

2 Safety Instructions

2.1 Designated Use

The devices described in this manual are decentralized input/output modules intended for connection to a field bus network.

The products described in this manual

- have been developed, manufactured, tested, and documented in compliance with the relevant standards. The equipment poses no danger to operating personnel or material if configuration, assembly and operation are performed in compliance with the stated handling and safety regulations.
- They meet the requirements contained in the standards and specifications listed in the datasheet.

Troublefree and safe function of this equipment is guaranteed only if the conditions for proper transport, storage, installation and assembly are observed.

This manual contains no product application information as specified in EN ISO 13849. Refer to the following manual for this information: Cube67 "Secure shutdown of malfunctioning secure modules“ Art. No. 56972

The designated operation of the equipment is guaranteed only when the housing is completely installed.

The power supply must comply with SELV or PELV. Power sources in accordance with EN 61558-2-6 (transformers) or EN 60950-1 (switched-mode power supply) meet these requirements.

Only qualified and suitably trained electrical tradesmen knowledgeable in the safety standards of automation technology may perform configuration, installation, setup, maintenance, and testing of the equipment.

Current safety and accident prevention laws valid for a specific application must be observed in the configuration, installation, setup, maintenance and testing of the equipment.

Only cables and accessories are allowed which meet the requirements and regulations for safety, electromagnetic compatibility and, where applicable, telecommunication transmission equipment and specifications.
Information concerning the type of authorized cables and accessories can be obtained either from your Murrelektronik distributor or are described in this manual.

CAUTION:
Good resistance to chemicals and oil. When using aggressive media, check the material resistance based on the application.

2.2 Qualified Personnel

Requirements to be met by qualified personnel are based on qualification profiles described in ZVEI and VDMA guidelines.

Weiterbildung in der Automatisierungstechnik (Further training in automation technology)
Herausgeber: ZVEI und VDMA (Publisher: ZVEI and VDMA)
Maschinenbau Verlag
Postfach 71 08 64
60498 Frankfurt

Only trained electricians familiar with the contents of this manual may be allowed to install and service the components described here.

These are understood as being persons who,

- based on their trade qualification, experience and knowledge of relevant standards, are able to assess the project requirements and to recognize possible hazards.
- based on extensive experience in comparable areas, possess the same level of knowledge as could be expected of a trained electrician.

Only Murrelektronik technical personnel are allowed to undertake intervention in the hardware and software of our equipment, unless the procedure is described in this manual.

CAUTION:
Unqualified intervention in the hardware and software of our equipment or disregard of warnings and information provided in this manual may result in injury or serious damage to humans and/or material.

2.3 Explanation of Symbols

2.3.1 Use of Attention Signs

Notes containing important information are specially marked. These are illustrated as follows :

Attention text.....

2.3.2 Use of Danger Signs

Danger signs are additionally marked with a surrounding border.

CAUTION:
Disregard of safety measures may result in damage to equipment and other serious consequences.

DANGER:
Noncompliance with the relevant safety measures poses a danger to the life and limb of the user.

2.3.3 Use of Numbering in Illustrations

Illustrations are numbered with white numbers on a round black field.
Example :
❶ Text 1.....
❷ Text 2.....
❸ Text 3.....

The explanatory text follows in tabular form under the same number, in direct context to the preceding illustration.

2.3.4 Use of Handling Instructions

Handling instructions describe the sequence of steps during installation, setup, operation, and maintenance that must be strictly observed.

The numbering (black numerals on a white field) is given in a sequential and ascending order.
Example :
① Instruction 1.....
② Instruction 2.....
③ Instruction 3.....

2.3.5 Use of Footnotes

Supplementary information is marked with superscript numerals (example: Text Text [1)] Text Text). These are explained in the form of footnotes under tables or text at the end of the page.

3 The Cube67 System

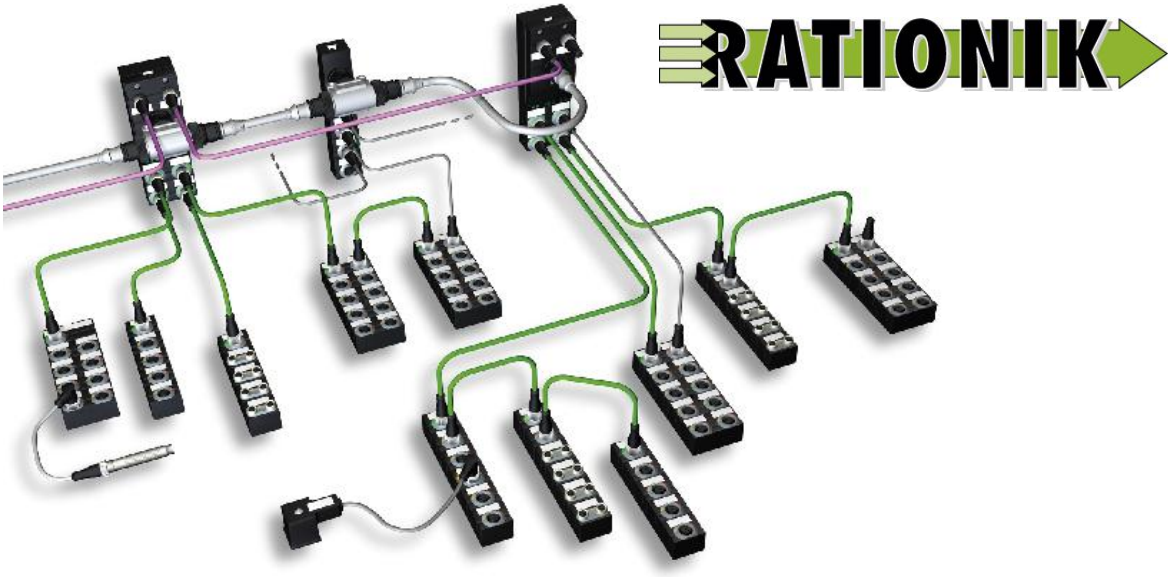


Fig. 3-1 : The Cube67 System

The Cube67 System is a tailor-made solution designed for decentralized applications in automation systems. This innovative system offers new possibilities:

Cost-effective decentralization...
... distributed, modular, compact ,and robust design.

- The I/O level is directly implemented in the machine, in the immediate proximity of sensors and actuators, thus eliminating bulky and complex wiring.
- Reduced dimensions ensure a compact and space-saving design of the machine.

Maximum flexibility...
... assured by multifunctional I/Os.
i.e. free parameterizability of the two signals per slot, whether input, diagnostic input or output.

"Fault detection instead of troubleshooting" – all-round diagnostic.
i.e. detailed information regarding the type and location of failures.

- Channel-related diagnostics.
  - Short-circuit in sensor power supply.
  - DESINA Diagnostics.
  - Actuator disable in case of short-circuit to 0 V or overload.
  - Actuator warning in case of short-circuit to +24 V.
- Graded voltage monitoring with diagnostic function.
- Monitoring, cutoff and diagnosis of the Cube67 system connection.

Mount, plug in – done!

Configuration Notes
This chapter contains a brief description of the Cube67 System components and information relevant to the electromechanical planning phase.

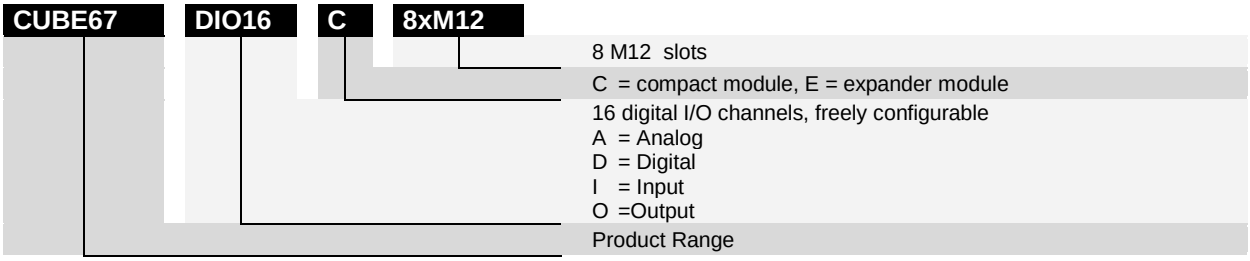
- Product designation
- Components
- Topology
- Permissible cable lengths
- Current-carrying capacity
- Power supply requirements

3.1 System Components

3.1.1 Product Designation

The designation of a Cube67 System component gives an indication of its function.

Example :



3.1.2 Bus Node

The task of the Cube67 System is to combine decentrally the signals of the I/O level and provide this information over the field bus network (e.g. PROFIBUS). The central unit is the bus node, which interconnects the Cube67 I/O modules and the field bus.

The bus node is powered via a 7/8“ power cable.

The bus node also has four connections for the internal system connection with connectivity for up to four I/O modules. In this way, it is possible to connect up to 16 I/O modules to one bus node.

Table 3-1 : Bus nodes

Art. No.	Designation
56 501	Cube67 BN-DP
56 502	Cube67 BN-DN
56 507	Cube67 BN-DN V2
56 504	Cube67 BN-C
56 531	Cube67 BN-P Hybrid
56 505	Cube67 BN-E Ethernet/IP
56 506	Cube67 BN-PNIO

It is possible to connect up to 16 I/O modules to one bus node. Up to four I/O modules can be attached to each terminal of the internal system connection.

3.1.3 I/O Modules

These modules are connected to the bus node via the internal system connection. I/O modules can be either compact or expander units.

3.1.4 Compact Modules

A compact module has no extension interface for the internal system connection; consequently it is the only, or the last module in a branch of the internal system connection.
The DIO 16 C 8xM12 also has a connection for an external actuator supply.

Table 3-2 : Compact modules

Art. No.	Designation
56 600	DIO 16 C 8xM12
56 610	DIO 8 C 4xM12
56 620	DIO 8 C 8xM8
56 602	DI 16 C 8xM12
56 612	DI 8 C 4xM12
56 622	DI 8 C 8xM8
56 640	DIO 16 C 8xM12 1,6 A
56 650	DO16 C Valve K3
56 700	AI4 C 4xM12 (U)

56 710	AO4 C 4xM12 (U)
56 720	AO4 C 4xM12 (I)
56 730	AI4 C 4xM12 (I)
56 740	AI4 C 4xM12 RTD
56 748	AI4 C 4xM12 TH

3.1.5 Expander Modules

Expander modules are fitted out with an extension interface for the internal system connection, i.e. the latter can be routed to the following I/O modules. Up to four I/O modules can be used on a branch. In this way, it is possible to connect up to 16 I/O modules to one bus node. An expander module can also be the sole, or the last module in a branch. In this case, a terminal resistance must be installed on the extension interface of the internal system connection (cf. chapter *0*

Terminal Resistance of the Internal S).

Table 3-3 : Expander modules

Art. No.	Designation
56 600 2	DO32 E Valve 0.5 A Cable 2m
56 601	DIO16 E 8xM12
56 605	DO12 E 6xM12 K3
56 611	DIO8 E 4xM12
56 621	DIO8 E 8xM8
56 631	DIO8 E 4xM12 1A
56 603	DI16 E 8xM12
56 613	DI8 E 4xM12
56 623	DI8 E 8xM8
56 641	DIO16 DO16 E 16xM12
56 642	DIO32 E 16xM12
56 650	DO16 C Valve K3
56 651	DO16 E Valve
56 653	DO16 E MAC (0,5A)
56 655	DO8 E Valve
56 656	DO32 E Valve 0.5 A
56 657	DO32 E MAC
56 661	DIO8 E Cable
56 661 00	DIO8 E Cable 2 m
56 662	DIO16 E Cable 0.5 A
56 663	DIO8 E M16 0.5 A
56 671	DI16/DO16 E Cable 0.5 A
56 681	DIO8/DI8 E TB Box
56 691	DIO8/DI8 E TB Rail
56 701	AI4 E 4xM12 (U)
56 711	AO4 E 4xM12 (U)
56 721	AO4 E 4xM12 (I)
56 731	AI4 E 4xM12 (I)
56 741	AI4 E 4xM12 RTD
56 749	AI4 E 4xM12 TH

3.1.6 Supplementary Modules

Supplementary modules have neither I/O functions, nor connection to the internal system connection. Diagnosis is only signaled by the LED indicators on the device. There is no diagnosis via the field bus.

Table 3-4 : Supplementary modules

Art. No.	Designation
56 955	PD 7/8”
56 960	R-P M12

For a functional description of Cube67 PD 7/8“ modules Art. No. 56 955, refer to chapter *3.2.5 External Actuator Power* Supply.

For a complete functional description of Cube67 R-P M12 Art. No. 56 960, refer to the PROFIBUS Repeater Manual (Art. No. 56 960).

3.1.7 Function Modules

Function modules are modules which have special functions in addition to their regular I/O functionality.

Table 3-5 : Overview of function modules

Art. No.	Designation
56 750	CNT2 C 4xM12
56 760	DIO4 RS 485 E 3xM12
56 771	Logic E 4xM12

3.1.8 NPN Modules

NPN modules are expansion modules with standard electronic functionality for NPN sensors.

Art. No.	Designation
56 606	DI16 E 8xM12 NPN
56 616	DI8 E 4xM12 NPN
56 626	DI8 E 8xM8 NPN

3.1.9 Cube20 Modules

For information on Cube20 module, refer to the Cube20 manuals.

3.1.10 Customer-Specific Modules

Customer-specific modules are modules which are based on a standard module and which are adapted to customer-specific solutions (e.g. different plug, cable length).

Table 3-6 : Overview of customer-specific modules

Art. No.	Designation
56 665 00	DIO8 E Cable M12 ID
56 601 50	DIO16 E 8xM12 VA
56 601 51	DIO16 E 8xM12 VA
56 611 50	DIO8 E 4xM12 VA
56 621 50	DIO8 E 8xM8 VA
56626 50	DI8 E 8xM8 NPN VA
56 603 50	DI16 E 8xM12 VA
56 701 50	AI4 E 4xM12 (U) VA
56 720 50	AO4 C 4xM12 (I) VA
56 730 50	AI4 C 4xM12 (I) VA
56 740 50	AI4 C 4xM12 RTD VA
56 748 50	AI4 C 4xM12 TH VA
56 651 00 56 600 1	DO16 E Valve CPV DO16 E Valve CPV 1.4 m
56 651 01	DO16 E Valve V
56 651 10	DO16 E Valve V20/22
56 651 11	DO16 E Valve VM10
56 651 12	DO16 E Valve V20/22 B
56 651 13	DO16 E Valve SMC
56 651 14	DO16 E Valve SMC M27
56 651 15	DO16 E Valve V20/22 C
56 651 16	DO16 E Valve MAC
56 651 51	DO16 E Valve CPV VA
56 651 52	DO16 E Valve SMC VA
56 681 00	DIO8/DI8 E TB Box PK
56 655 00	DO8 E Valve CPV
56 655 01	DO8 E Valve CPV(9)
56 656 00	DO24 E Valve VM10

Art. No.	Designation
56 656 01	DO24 E Valve MPA
56 656 02	DO32 E Valve HF03
56 656 03	DO32 E Valve VM10
56 656 04	DO23 E Valve SMC
56 656 05	DO22 E Valve CPA
56 656 06	DO24 E Valve HF04
56 656 07	DO24 E Valve SMC M27
56 656 09	DO32 E Valve MAC
56 656 10	DO32 E Valve Vesta
56 656 11	DO22 E Valve Vesta
56 665 00	DIO8 E Cable M12 ID
56 600 0	DIO8 E Cable M12 ID 1,2m

3.1.11 Internal System Connection – Hybrid Line

The green system line is a shielded hybrid line for

- communication between bus node and I/O modules.
- transfer of sensor supply.[1]
- transfer of actuator power supply.

Use only our preterminated lines for the internal system connection.

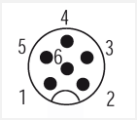
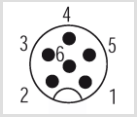
Table 3-7 : Internal system connections

Length	Art. No.	
	straight-straight	90°-90°
0.3 m	7000-46041-8020030	7000-46061-8020030
0.6 m	7000-46041-8020060	7000-46061-8020060
1.0 m	7000-46041-8020100	7000-46061-8020100
1.5 m	7000-46041-8020150	7000-46061-8020150
2.0 m	7000-46041-8020200	7000-46061-8020200
2.5 m	7000-46041-8020250	7000-46061-8020250
3.0 m	7000-46041-8020300	7000-46061-8020300
3.5 m	7000-46041-8020350	7000-46061-8020350
4.0 m	7000-46041-8020400	7000-46061-8020400
4.5 m	7000-46041-8020450	7000-46061-8020450
5.0 m	7000-46041-8020500	7000-46061-8020500
5.5 m	7000-46041-8020550	7000-46061-8020550
6.0 m	7000-46041-8020600	7000-46061-8020600
6.5 m	7000-46041-8020650	7000-46061-8020650
7.0 m	7000-46041-8020700	7000-46061-8020700
7.5 m	7000-46041-8020750	7000-46061-8020750

[1] The supply voltage of Cube67 I/O modules is drawn from the sensor power supply.

Length	Art. No.	
	straight-straight	90°-90°
8.0 m	7000-46041-8020800	7000-46061-8020800
8.5 m	7000-46041-8020850	7000-46061-8020850
9.0 m	7000-46041-8020900	7000-46061-8020900
9.5 m	7000-46041-8020950	7000-46061-8020950
10.0 m	7000-46041-8021000	7000-46061-8021000

Table 3-8 : Contact arrangement of the system connection

	Arrangement	Contacts	Meaning
Male		1	Actuator power supply
		2	Sensor power supply / internal module power supply
		3	Ground
		4	Internal system connection
		5	Internal system connection
		6	Ground
Female		1	Actuator power supply
		2	Sensor power supply / internal module power supply
		3	Ground
		4	Internal system connection
		5	Internal system connection
		6	Ground

3.1.12 "External Power" cables

The odd-numbered M12 sockets (1,3,5,7) of Cube67 DIO16 C 8xM12 compact modules require an external actuator power supply, which is provided via an "External Power" cable.

Table 3-9 : External power cables

Length	Art. No.	
	straight-straight	90°-90°
0.3 m	7000-46001-4140030	7000-46021-4140030
0.6 m	7000-46001-4140060	7000-46021-4140060
1.0 m	7000-46001-4140100	7000-46021-4140100
1.5 m	7000-46001-4140150	7000-46021-4140150
2.0 m	7000-46001-4140200	7000-46021-4140200
2.5 m	7000-46001-4140250	7000-46021-4140250
3.0 m	7000-46001-4140300	7000-46021-4140300
3.5 m	7000-46001-4140350	7000-46021-4140350
4.0 m	7000-46001-4140400	7000-46021-4140400
4.5 m	7000-46001-4140450	7000-46021-4140450
5.0 m	7000-46001-4140500	7000-46021-4140500

3.1.13 Preterminated 7/8“ Power Cables

The Cube67 System is supplied with voltage via a 7/8" connector. The voltage supply for the sensors and actuators can be fed in separately. The ground of both supply voltages is connected internally. The operating voltage of the Cube67 components is drawn from the sensor power supply.

Table 3-10: 7/8“ power cable

Length	straight - straight	angled - angled
0.3 m		
0.6 m		
1.0 m to 10.0 m in steps of 0.5 m		

For more information on 7/8“ power cables, please refer to our catalog or our online shop at:

onlineshop.murrelektronik.com

3.2 Internal System Connection

Use only our preterminated lines for the internal system connection.

CAUTION:
Inverting Cube67 I/O modules in a system may result in injury or serious damage to humans and/or material.
When comparing planned and actual configuration, the Cube67 system is basically unable to distinguish between identical or replaceable modules. Therefore, it is important to label Cube67 system cables and Cube67 I/O modules clearly.

3.2.1 Current-Carrying Capacity

The modules connected to the bus node are supplied with two voltages via the internal system connection.

Table 3-11 : Current-carrying capacity

	Current-carrying capacity	Supply of
sensor power voltage	4 A	Module electronics and sensors
Internal actuator supply	4 A	Actuators

CAUTION:
Make sure to avoid feedback of the sensor supply voltage caused by external power supply of the Cube67 system.

3.2.2 Maximum Expansion

The maximum length per branch may be maximum 10 m. Above a cable length of 5 m, measures are required to protect the wire between the power supply unit and the bus node. In this case, a MICO (Murrelektronik Intelligently Current Operator) may be used since, at cable lengths greater than 5 m, it is not possible to assure safe overload cutoff in the bus node. An overview of available MICO variants is contained in Table 3-12 below.

The MICO activates the circuit-breaker between the power supply unit and the bus node. It protects the power supply unit in case of a fault, for example, an externally produced short-circuit in the Cube67 system line, and prevents an overload in the power supply unit.

Without MICO or an equivalent selective fuse, the length per branch of the internal system connection may not exceed 5 m. The number of modules in a segment has no influence on the permissible length.

A total of up to four segments each 5 m or 10 m long (with the bus node upstream of the MICO or an equivalent selective fuse) can be operated on a bus node.

The permissible length of the internal system connection at a branch may be a maximum of 10 m when a bus node upstream of the MICO or an equivalent selective fuse is fitted. Without MICO or an equivalent selective fuse, the line length at a branch is limited to 5 m.

If a MICO is connected on line side, the complete bus node is disconnected from the power supply unit.
(All subordinate systems out of function).

Table 3-12 : Overview of MICO variants

Art. No.	Designation	Rated operating branch-circuit current (full load)
9000-41034-0100400	MICO 4.4 (4 channels)	each 4 A
9000-41034-0100600	MICO 4.6 (4 channels)	each 6 A
9000-41034-0401000	MICO 4.10 (4 channels)	each 10 A
9000-41042-0100400	MICO 2.4 (2 channels)	each 4 A
9000-41042-0100600	MICO 2.6 (2 channels)	each 6 A
9000-41042-0401000	MICO 2.10 (2 channels)	each 10 A

3.2.3 Topology

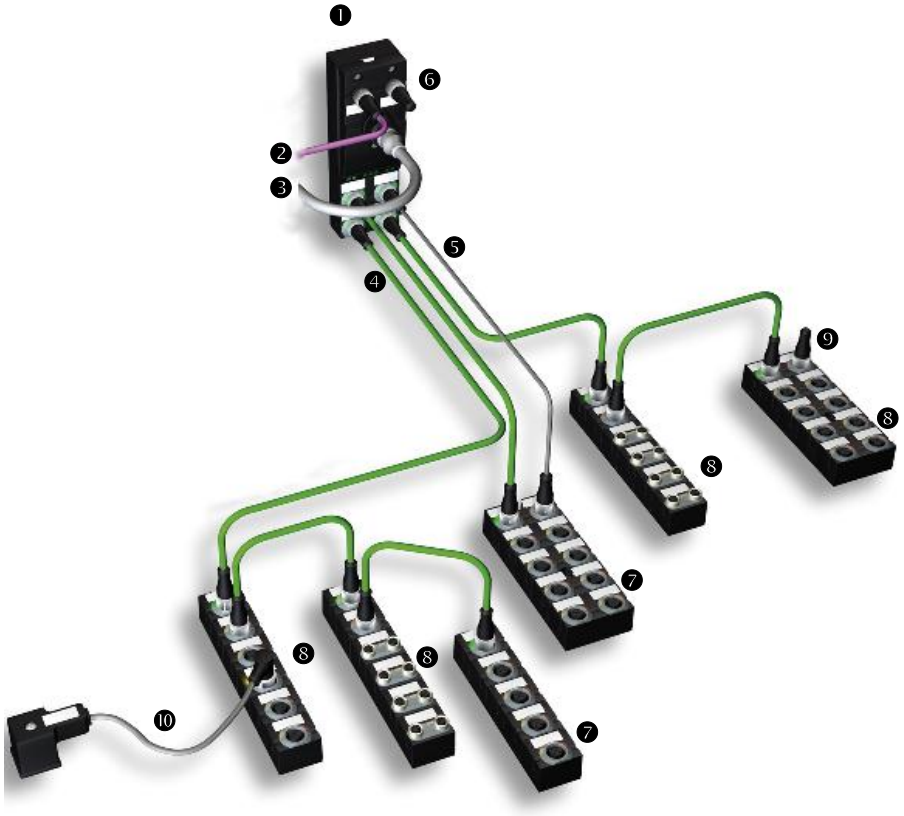


Fig. 3-2 : Topology

❶ Bus node
❷ Field bus line
❸ Auxiliary power supply
❹ Internal system connection
❺ External actuator supply
❻ Field bus terminal resistance
❼ Compact module
❽ Expander module
❾ Terminal resistance of internal system connection
❿ Sensor/actuator

The bus node has four connections for I/O modules. It is not necessary to set the addresses of the modules. The modules are actuated automatically in the order of connection. Unused connections are ignored, i.e. it is possible to connect a module to socket 0, leave socket 1 unused, and connect the next module to socket 2.

3.2.4 Bus Node Used As Power Distributor

If some branches of the bus node internal system connection are not assigned, they can be used to supply consumers, provided that the maximum permissible current is within the limits. Please note that only the actuator power supply can be used in this case. The sensor power supply is cutoff on free branches. The actuator power supply is applied as soon as the internal system connection is initialized.
The external actuator power supply of Modules Art. No. 56 600 DIO16 C 8xM12 and Art. No. 56 640 Cube67 DIO16 C 8xM12 1,6A can be drawn from the bus node.

3.2.5 External Actuator Power Supply

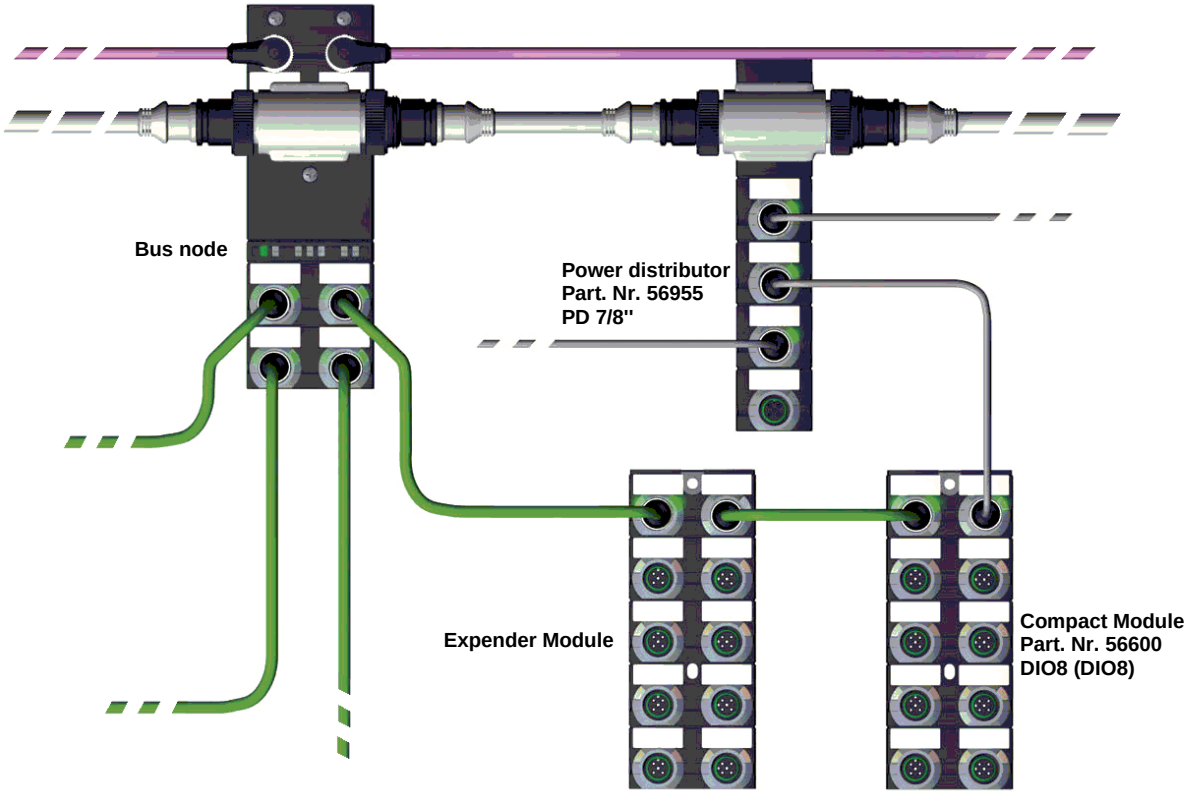


Fig 3-3 : Use of the Cube67 PD[2] 7/8" power distributor (example)

The Cube67 PD 7/8“ power distributor feeds the actuator power supply of compact modules Art. Nos. 56 600 and 56 640. The power distributor guarantees an active power circuit. It is fitted with short-circuit detection at the outputs. The LED indicators on the M12 sockets display the status of the output voltage.
The power distributor may not be used to supply the bus node via the internal system connection. It is also prohibited to supply the green system line.

CAUTION:
Do not use the power distributor to supply the bus node via the internal system connection. It is also prohibited to supply the green system line.

[2] PD – Power distributor with 7/8“ connection

3.2.6 Terminal Resistance of the Internal System Connection

A terminal resistance must be installed on each branch of the internal system connection.

Compact modules have an integrated terminal resistance. If the last I/O module in a branch is a compact module, it is not necessary to install a supplementary terminal resistance. If the last module is an expander module, the extension interface of the internal system connection must always be fitted with a terminal resistance. Unused connections at bus modes and modules must be provided with dummy plugs. Fig. 3-4 shows where the terminal resistances must be installed by means of a configuration example.

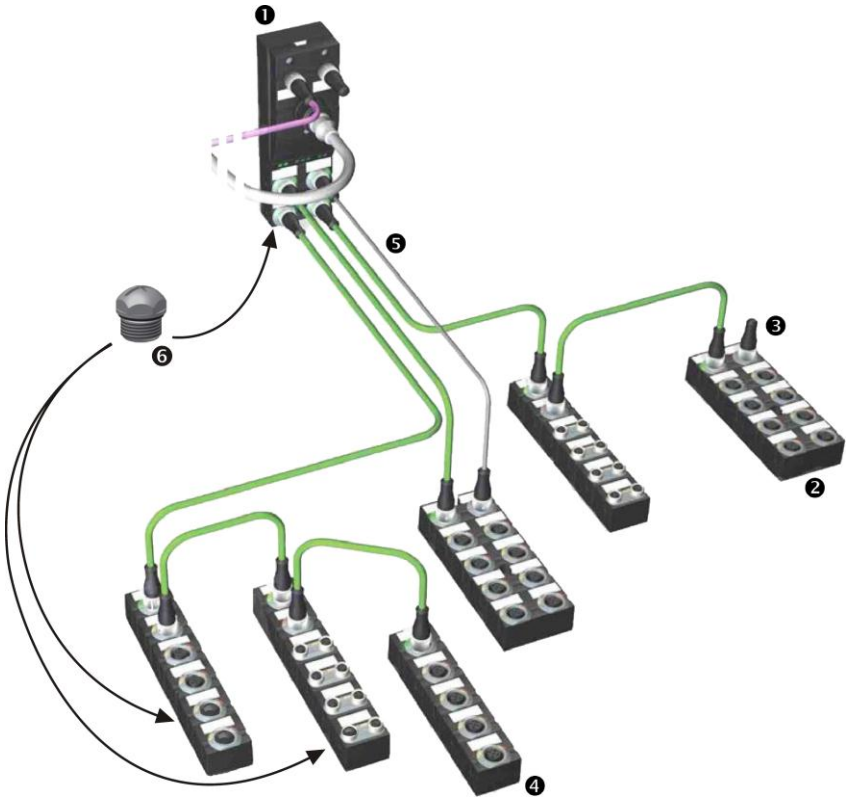


Fig. 3-4 : Terminating the internal system connection (example)

❶ Bus node
❷ Expander module
❸ Terminal resistance
❹ Compact module
❺ Unused bus branch without terminal resistance
❻ Fit dummy plugs to unused connections on bus modes and modules.

Art. No.	Designation
7000-14041-0000000	Terminating resistor M12 PROFIBUS (connector)
7000-13461-0000000	Terminating resistor M12 DeviceNet / CANopen (connector)
7000-13471-0000000	Terminating resistor M12 DeviceNet / CANopen (socket)
7002-15041-0000000	Terminating resistor M12 for the internal system connection (connector)
38 586 27	M8 PLASTIC SCREW PLUG VE 10 (dummy plug)
58 627	M12 PLASTIC SCREW PLUG VE 10 (dummy plug)
Art. No.	**Designation**
56951	M12 SCREW PLUG VE 4 (dummy plug)
7000-13481-0000000	M12 Diagnostic dummy plug VE 1 (jumper PIN 1 to PIN2)

3.3 Power Supply

3.3.1 Configuration Notes

Cube67 runs on a DC voltage of 24V DC (typical) which must meet the regulations for conventional industrial power supplies.

Primary-switched power supply units usually allow an increase in output voltage vs. rated voltage in order to compensate for line losses.

It is recommended to draw the sensor and the actuator power supply from separate voltage sources in order to optimize EMC. Power should be supplied via primary-switched or unregulated power supplies.

The capacity of the power supply units is dependent on the number and capacity of the connected consumers.

CAUTION:
In any case, it must be ensured that the system voltage (sensor power supply) measured at the remotest module from the system power supply does not drop below 18 VDC.

Cube67 I/O modules with digital inputs support direct connection of commercially available sensors. A separate voltage supply should, where necessary, be used for the sensors depending on total power demand. This may result from the number of I/O modules, or when using sensors with a high power consumption.

CAUTION:
Sensors may only be supplied via the bus node in a Cube67 system. Feedback by sensors or an external power supply (in order to increase maximum current) is not permissible.

3.3.2 Recommended Power Supply Units MCSPower+

Primary-clocked power supply units of the MCS Power+ series are specially designed to supply systems in automation engineering. We recommend therefore that you use them to supply Cube67.

Note for DeviceNet users :
To supply the DeviceNet bus, we recommend Class 2 power supply units.

Please contact our sales assistants for information about these power supply units certified to ODVA.

Table 3-13 : Recommended power supply units MCS Power+ (single-phase)

Phases	Output power	Input voltage 95 to 132 VAC	Input voltage 185 to 265 VAC
1	240 W / 10 A	85086	85085
1	480 W / 20 A	85088	85087

Table 3-14 : Recommended power supply units MCS Power+ (three-phase)

Phases	Output power	Input voltage 3 x 340...460 V AC
3	240 W / 10 A	85095
3	b40 W / 20 A	85097
3	b40 W / 40 A	85099

3.4 Connecting Sensors and Actuators

3.4.1 Sensor Power Supply

Sensors can be supplied by the I/O module[3]. One resettable PTC per M12 socket protects the sensor supply. The maximum current draw for the sensor power supply is 200 mA for each M12 socket. Please note the following derating diagram.

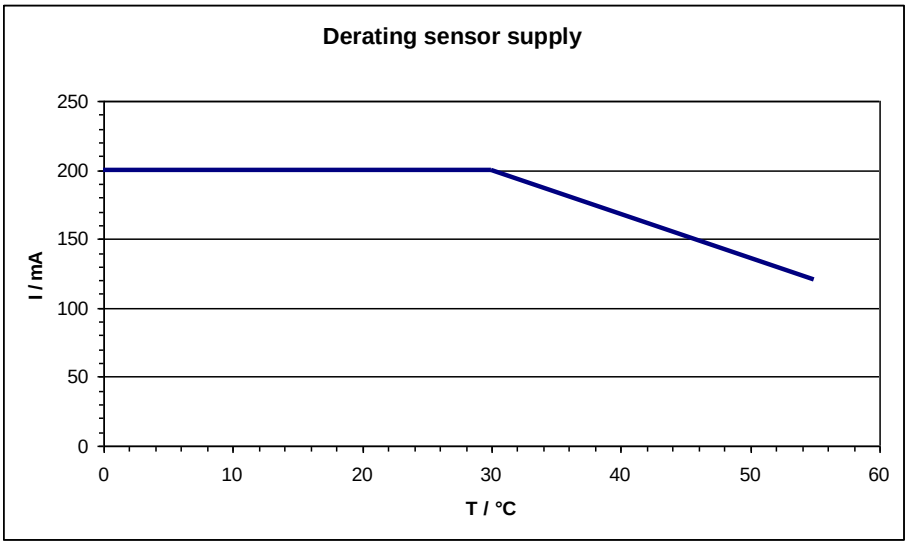


Fig. 3-5 : Derating sensor supply

CAUTION:
Please note that the sum current of all sensors and modules supplied via the bus node in a Cube67 system may not exceed 9 A.

CAUTION:
Sensors can only be supplied via the bus node in a Cube67 system. Feedback by sensors or an external power supply (in order to increase the max. current) is not permissible.

ATTENTION:
Capacity per digital input is 10 nF.

ATTENTION:
The maximum permitted capacitance may not exceed 220 µF.

3.4.2 Supply of External Modules (Art. No. 56 710 / 56 720)

Analog output modules Art. Nos. 56 710 and 56 720 can be supplied via Pin 1 of the M12 socket[3] by the actuator power supply (not switchable). When measuring the total current of 4 A for the whole branch, the maximum current draw per slot is 1.6 A.

3.4.3 Analog Setting Modules

They can be connected to analog output modules Cube67 AO4 C 4xM12 (U)/(I).
The power for analog output variables of Cube67 modules Art. Nos. 56 710 / 56 720 is drawn from the sensor power supply. The output value is not dependent on the actuator power supply status.

The output value of Cube67 AO4 C 4xM12 (U)/(I) modules is <u>not</u> dependent on the actuator power supply status.

3.4.4 Actuators

The maximum current drawable from the outputs can be found in the Technical Data (User Manual Art. No. 56 971).

Please observe the maximum current-carrying capacity of the power supply on the bus node or other power supplies. With a 7/8“ power connector, the maximum total current for the actuator supply is 9 A.

CAUTION:
When extending the actuator supply via the internal system connection, take care to ensure that the total current of all modules in the segment does not exceed 4 A.

CAUTION:
The total current of all actuators supplied via the bus node or a power distributor in a Cube67 system may not exceed 9 A.

CAUTION:
Reverse polarity of the actuator power may damage the module!

[3] Not for Art. No. 56 710 / 56 720 / 56 740.
[4] The assignments of the M12 socket for the module Cube67 AO4 C 4xM12 (U)/(I) are described in Technical Data, User Manual Art. No. 56 971.

To increase power, outputs may be connected in parallel.

If an overload or short-circuit occurs at an output, the output affected is disabled. This output remains disabled even after the fault is rectified. In order to reset the short-circuit memory, reset the output or switch off the actuator power supply.

3.4.5 DESINA Diagnostic Input

Pin 2 of the M12 socket can be configured as a diagnostic input on all modules. If a 0 volt signal is present at a diagnostic input , it is displayed inverted in the process map. At the same time, a channel-specific diagnostic message is issued in the diagnostic data.

3.4.5.1 Examples of Application of DESINA Diagnostic Function Pin 2

Pin 2 basically behaves like an inverting input when it is configured as a diagnostic input.
The special thing about Pin 2 is that the assigned LED lights up red when a voltage of 0 V -> logical "1" is applied. It is therefore possible to indicate faults on external devices at Cube67. Several proposals are given in the following.

3.4.5.2 Connecting Sensors/Actuators with Diagnostic Output

Imagine you are using a sensor or an actuator with a diagnostic output. You can evaluate this diagnostic signal. You can also process and display it on the controller or visualization unit using a conventional I/O system. Two inputs are always required.
However, you have no visual fault display in the proximity of the defective sensor, which is probably also fitted in a concealed location. Visual indication at the M12 socket of the Cube67 also helps accurate onsite fault localization.

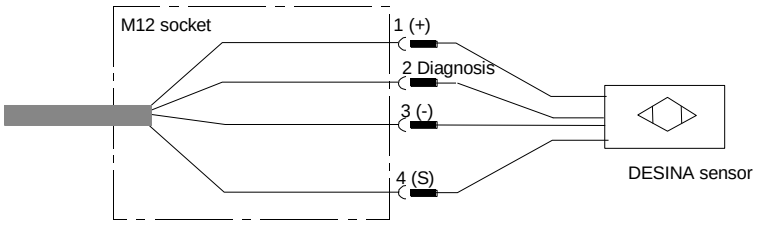


Fig. 3-6 : Connecting sensors/actuators with diagnostic outputs

Detection of :

- *Damage to the end face*
- *Defective electronics*
- *Wire break*

3.4.5.3 *Monitoring a Line for Line Breaks*

Murrelektronik GmbH supplies the M12 diagnostic adapter with a simple accessory that helps you to monitor M12 lines to the sensors or actuators of your system for **line breaks**.

CAUTION:
Do not connect a line with LED in the plug to a Desina sensor; otherwise line break cannot be detected.

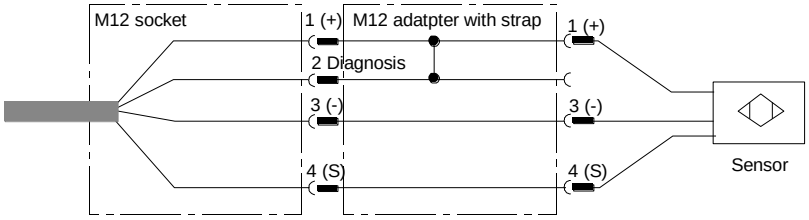


Fig. 3-7 : Monitoring a line for line breaks

3.5 Electromagnetic Compatibility (EMC)

CE

This device meets the requirements specified in the EC Directive 2004/108/EC "Electromagnetic Compatibility“

CAUTION:
This is Class A and B equipment. The system producer alone is responsible for ensuring that the complete system complies with the applicable EMC requirements.

Each of the devices described in this manual meets the EMC requirements laid down in the relevant standards. However, this does not guarantee their electromagnetic compatibility when used in a system.

The user is therefore strongly recommended to observe the following information on installation to ensure EMC protection. Only if these conditions are met and individually CE-labeled components are used may it be assumed that the complete system meets the applicable EMC requirements.

3.5.1 Protection Against Electrostatic Discharge

The products described in this manual contain complex semiconductor elements that can be destroyed or damaged by electrostatic discharges (ESD). Damage does not necessarily result in an immediately recognizable failure or malfunction. Failure or malfunctioning can occur with delayed effect or sporadically.

CAUTION:
Never pull or plug in connectors while the equipment is under power.

Always observe the generally known safety precautions for ESD sensitive devices when handling the devices. Take the following precautions in particular:

CAUTION:
Personnel entrusted with the installation must be electrostatically discharged before handling the equipment. This can be accomplished by either touching a grounded part of the installation or by the personnel wearing a correctly grounded ESD wrist strap.

CAUTION:
Unused connections must be fitted with a dummy plug.

3.5.2 Grounding

A short and low impedance connection between the grounding terminal and ground is required to draw off interference voltages occurring between the device and ground. The inductance of conventional FE[4] cables is a source of high impedance for high-frequency interference voltages. For this reason, the use of grounding strips is preferred. If this is not possible, use a fine-stranded FE cable of large cross-section and keep the distance to ground as short as possible.

3.5.3 Cable Routing

A frequent cause of EMC problems is failure to observe the elementary rules of cable routing.

- ✓ The field bus line must be laid as far away from power lines as possible.
- ✓ A minimum distance of 10 cm must be maintained.
- ✓ Data lines and power lines should only cross at right angles.
- ✓ It is recommended that data lines and power lines be laid in separate and shielded conduits.
- ✓ The interference potential of other devices or lines must be taken into account when laying cables. The greatest possible distance must be maintained to frequency inverters, motor lines and other devices, or lines which emit high frequency interference.

3.5.4 Voltage Drops

The power supply to the electronics is buffered by means of integrated capacitors so that a short-term voltage drop will not usually affect normal operation. This does not apply to sensors and actuators connected to the Cube67 as their high power requirements cannot be buffered by integrated capacitors. Even a short-term interruption in actuator power supply can therefore result in undesired switching operations.
Interruption of the sensor supply voltage < 1 ms does not result in any change to the input status reported to the DP Master, thanks to the integrated input filter. Lengthier sensor supply interruptions, however, can lead to a signal change at the inputs.

3.5.5 Separate Power Supplies

Sensors or actuators can be supplied with power from a common source. For maximum electromagnetic compatibility throughout the system, however, separate power supplies are advisable.

[4] FE Function Ground

3.5.6 Inductive Load Interference Suppression

The outputs in the devices described in this manual feature an integrated surge protection circuit against interference voltage that arises when switching inductive devices.

The varistor ensures rapid dissipation of the energy stored in the magnetic field of the inductive load.

The high voltages which occur when switching off inductive loads produce strong fields in the wiring. These fields can in turn trigger faults in adjacent circuits or devices. For this reason, it is recommended that an additional inductive load circuit be provided where large distances exist between the module output and the load, or where high inductive loads occur for other reasons. As a result, the voltage peak produced by the inductive load is short-circuited directly at source.

Murrelektronik GmbH offers a wide range of interference suppression products for this purpose.

3.5.7 Limits and what can still be done...

System configurations are conceivable where the interference emission and noise immunity requirements can only be met by implementing additional resources or not at all, as the EMC in the system is also dependent on the products of other manufacturers.

- ✓ Line filters are suitable for reducing power related interference.
- ✓ Various manufacturers offer fiber-optic converters. Data transmission through fiber-optic cables is less sensitive to EMC interference. This does not, however, apply to the electronics required for the conversion. As such, fiber optics cannot solve all EMC-related problems.

Should you have any further questions regarding EMC, or require advice on fulfilling the EMC directives in your installation, please contact our accredited test center.

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